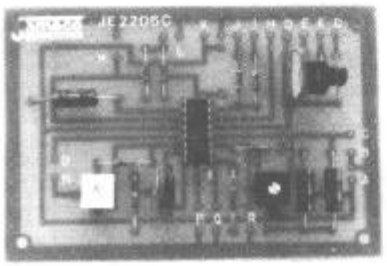
JAMECO™
ELECTRONIC COMPONENTS
COMPUTER PRODUCTS

KIT ASSEMBLY INSTRUCTIONS

20685 (JE2206) FUNCTION GENERATOR KIT



GENERAL DESCRIPTION:

The 20685 (JE2206) Function Generator kit is a single-board assembly incorporating the basic circuit necessary for a sine, square and triangle wave generator, of high stability and accuracy, that may be amplitude and frequency modulated. The kit is intended to be incorporated into a higher assembly of the user's own design that adds power supply, controls and housing.

- Operation from either +12VDC or +/- 6VDC @ 15 mA
- Frequency capability, 1-100K Hz in 4 ranges
- Frequency variability, 1:100 within each range
- Frequency accuracy, dependent upon timing capacitors and user's potentiometer; calibration by user
- Sine/triangle output amplitudes variable, 0-6VPP for sine and 0 to V+/- for triangle, with 600 Ω source impedance.
- Maximum sinewave distortion, 1%, 10-10K Hz and 3%, 10K-100K Hz
- Linear frequency modulation capability; range dependent on center frequency
- Linear amplitude modulation capability; range 55dB
- Other criteria as determined by Exar XR2206 function generator IC

PARTS LIST:

Component Reference	Part Number	Product Description	Quantity
IC1	34972	IC Function Gen XR2206	1
C1, C2, C7	10882	Capacitor, Axial, Elec, 10µF, 25V	3
C[illegible]	27001	Capacitor, Non-polar, Mylar, 1µF, 100V (1K)	1
[illegible]	26956	Capacitor, Non-polar, Mylar, .1µF, 100V (104)	1
[illegible]	26884	Capacitor, Non-polar, Mylar, .01µF, 100V (.01)	1
[illegible]	26833	Capacitor, Non-polar, Mylar, .001µF, 100V (102)	1
R1	30761	Resistor, ¼W, 30K (ORN-BLK-ORN)	1
R2	29989	Resistor, ¼W, 100K (BRN-BLK-YEL)	1
R3, R7	29655	Resistor, ¼W, 1K (BRN-BLK-RED)	2
R4	31659	Resistor, ¼W, 9K (WHT-BLK-RED)	1
R5, R6	31229	Resistor, ¼W, 5.1K (GRN-BRN-RED)	2
R8	30787	Resistor, ¼W, 300 ohms (ORN-BLK-BRN)	1
R9	42981	Resistor, Pot, 1Meg (105)	1
R10	42964	Resistor, Pot, 1K (1K)	1
R11	35511	Resistor, Pot, 25K (253)	1
	20706	JE2206-1 PC Board	1
	20693	Kit assembly instructions for 20685 (JE2206)	1

The following components are externally mounted from the JE2206 Board and are not included with this kit. They are available from Jameco Electronics:

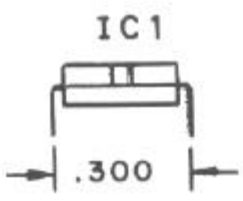
R12	43107	Resistor, Pot, P50K, 50K	1
R13	42981	Resistor, Pot, P1Meg, IM	1
S2	22832	Switch, LFH123	1
PS	20626/73613	Power Supply JE215 or JE225	1

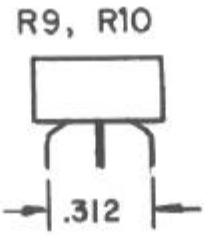
All above components may be purchased separately from Jameco using the 5-digit part number.

ASSEMBLY PREPARATION AND PROCEDURES:

1. Important: Identify all parts on parts list before proceeding.
2. Suggestion: Simulate board assembly by placing the components in their actual place on the picture assembly, then transfer components to the actual board during assembly.
3. Tools required:
   - Small soldering iron, 27W to 35W.
   - Resin core solder, .03" Dia. SN60 or SN63. Do not use acid core type or 50/50 solder.
   - Small sponge (water dampened) for cleaning solder tip.
   - Small wire cutter/stripper.
   - Small long nose plier.
   - Screw driver.
   - DC meter 0 to 18VDC range.

Component lead bending for IC1, R9 and R10.





20685 (JE2206) FUNCTION GENERATOR KIT

SOLDERING TIPS:

1. Feed the solder to the crack between the iron tip and the solder pad next to the component lead.
2. Leaving the iron tip too long on a pad will cause the pad to lift, as well as damage the component. Allow approx. 2 seconds per solder joint.
3. Using too much solder can cause the solder to bridge across traces and pads.
4. Keep iron tip clean by wiping the tip across a water dampened sponge —frequently.

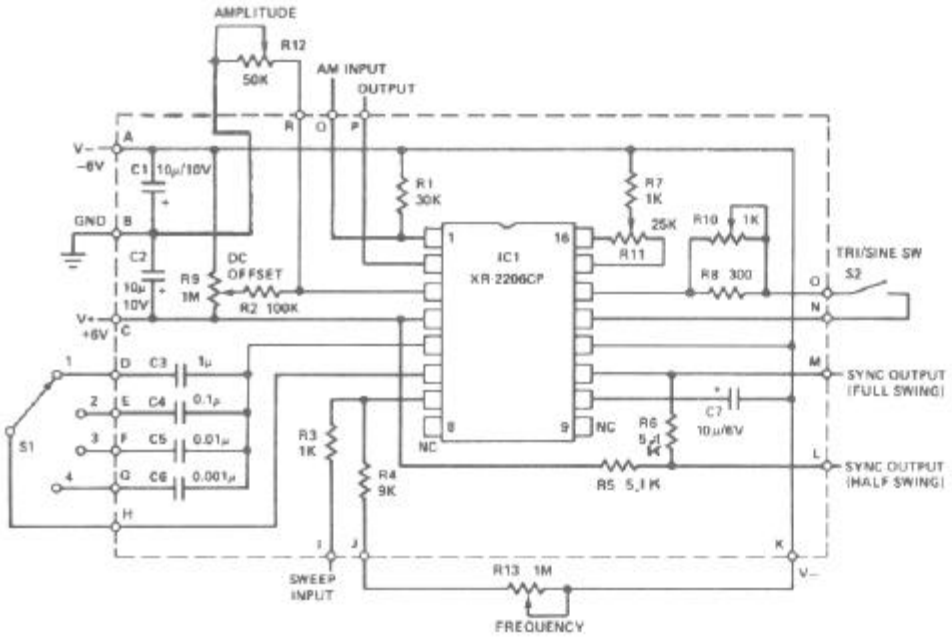
ASSEMBLY INSTRUCTIONS:

READ ALL THE INSTRUCTIONS BEFORE STARTING.

Before assembly determine if a split supply or a single supply will be used as the placement of C1, C2 and R12 will change (with an addition of a jumper wire).

1. Printed wiring board assembly.
   - 1.1 Start the board assembly by placing the PW board to the position shown on the assembly picture.
   - 1.2 Insert resistors R1 through R8 into board. Observe the color code of each resistor as you install them. Bend resistors leads under the board to contain the components. Solder and clip leads.
   - 1.3 Insert IC1 into board. Be sure that the notch at the end is located properly as shown for number 1 pin identification. Solder leads.
   - 1.4 Insert resistors (pot) R9, R10 and R11 as shown. Resistors R9 and R10 will require spreading of the leads to match the hole spacing on the board. Solder leads.
   - 1.5 Insert capacitors C1, C2 and C7 into the board. Note that the leads are polarized and must be placed as shown. Clip and solder leads.
   - 1.6 Insert capacitors C3, C4, C5 and C6. The capacitance values are marked on the components as shown in parenthesis. C3, 1µf (1K). C4, 0.1 µf (104). C5, .01 µf (.01). C6, .001 µf (102). Solder and clip leads.
2. Final assembly check-out:
   Do not attempt to apply power to the board until a final check has been made to verify the correctness of all assembled components. Component IC1 will be damaged if placement is turned around. Board will malfunction if capacitors C1, C2 and C7 are not properly placed. Capacitors will be damaged after short usage. Erratic signal patterns will result from incorrect placement of resistors.

Schematic Diagram



1. For single supply operation lift GND connection.Keeping R12 across terminals R and B intact, and connect terminal A to GND.
2. Omit GND (⏚) with single supply operation.

Figure 1

Board assembly guide for single supply

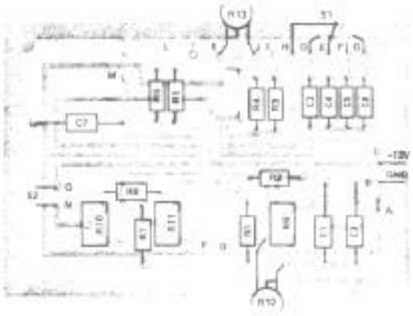
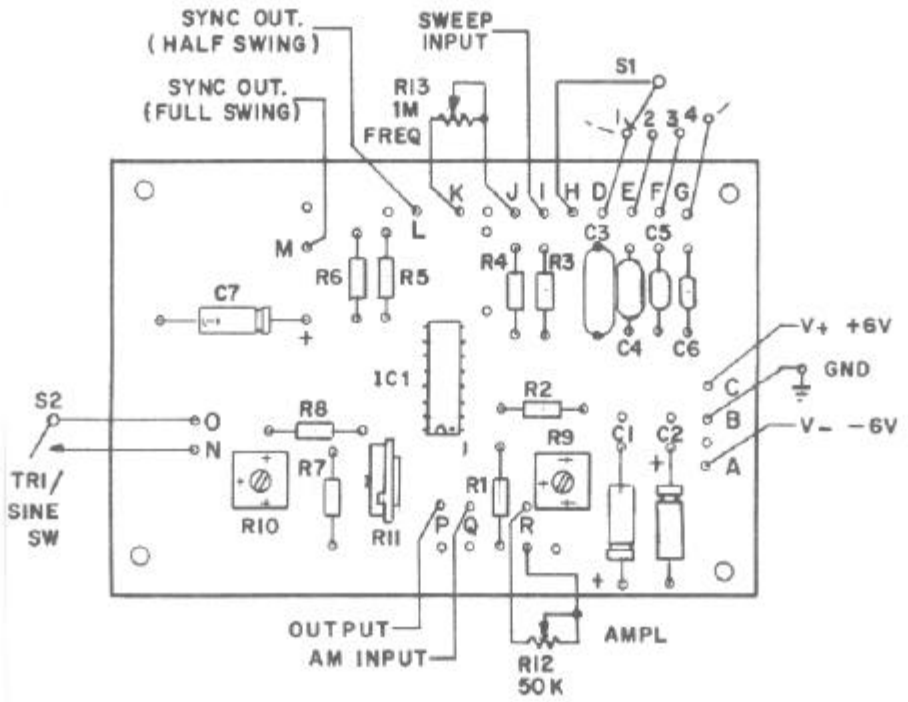


Figure 2

Printed Wiring Board Assembly
Split supply assembly shown

Figure 3



NOTES:

1. REFER TO PARTS LIST FOR COMPONENT VALUES.
2. FOR SINGLE SUPPLY ASSY SEE FIG 2.

OPERATIONAL CONSIDERATIONS:

1. The schematic drawing (Fig 1) shows the components supplied in the 20685 (JE2206) kit within the dashed lines. The other components and the power supply and the enclosure are to be supplied by the user. In addition, setting up the Function Generator kit will require a digital counter for frequency calibration and a general purpose oscilloscope for the calibration of sine wave output wave forms and amplitude adjust.

2. The controls:
   2.1 S1, frequency range.

Position	Range
1	1-100 Hz
2	10-1K Hz
3	100-10K Hz
4	1K-100K Hz

   2.2 S2, waveshape. Open for triangle, close for sine.
   2.3 R9, DC offset. Adjust for OVDC output-offset voltage.
   2.4 R10, sinewave distortion. Minimizes harmonic distortion. Adjust with R11.
   2.5 R11, sinewave symmetry. Optimizes Symmetry. Adjust with R10.
   2.6 R12, output amplitude. Sets amplitude of sine or triangle output.
   2.7 R13, frequency. Varies frequency of output signal approximately 1:100 on each range.

3. Capacitors C3, C4, C5 and C6 are +/- 5% mylar capacitors as supplied. For more accurate matching of potentiometer dial-calibration between ranges, and/or for greater stability, the user may substitute other capacitors of the same nominal capacitances.

4. **PRECAUTION:** Keep the lead length short for the range selector switch (S1).

5. The JE2206 is designed for 12V or +/- 6V but will operate up to a maximum of 26V or +/- 13V. Whatever supply is used, take care to observe correct polarity as otherwise, damage to the IC may result.

6. The sine/triangle output (terminal P) amplitude is varied by R12. The output impedance is 600Ω. The square wave (sync) outputs are derived from a grounded-emitter transistor collector connecting within the IC to terminal M. Sync-current at this terminal should not exceed that which will pull the LOW voltage higher than 0.5V above ground.

7. Applied voltage at terminal I for the purpose of frequency modulation or sweeping should be limited to a maximum of +/- 3V about the open-circuit potential of +3V. The voltage-to-frequency factor is about 0.00032/ Cμf Hz/V where C is the particular timing capacitor connected by S1.

8. Linear amplitude modulation will occur for input voltages at terminal Q between +/- 4V about V+/ 2. The phase of the output signal is reversed and its amplitude goes through zero at V+/ 2.

9. Adjust the DC offset of the sine/triangle output with R9. Adjust for minimum sine-wave distortion with R10 and R11 alternately adjusted.

20685 (JE2206) Function Generator Kit (Schematic Drawing)

OPERATIONAL COSIDERATIONS: (continued)

10. Sync Output: The sync output provides a 50% duty cycle pulse output with either full swing or upper half swing of the supply voltage depending on the choice of sync output terminals on the printed circuit board (see fig. 1).

11. Frequency Modulation (External Sweep): Frequency can be modulated or swept by applying an external control voltage to sweep terminal (terminal I of fig. 1). When not used, this terminal should be left open-circuited. The open circuit voltage at this terminal is approximately 3V above the negative supply voltage and its impedance is 1000 ohms.

12. Amplitude Modulation (AM): The output amplitude varies linearly with modulation voltage applied to AM input (terminal Q of fig. 1). The output amplitude reaches its minimum as the AM control voltage approaches the half of the total power supply voltage. The phase of the ouput signal reverses as the amplitude goes through its minimum value. The total dynamic range is approximately 55 dB with AM control voltage of 4V referenced to the half of the total supply voltage. When not used, AM terminal should be left open circuited.

ADJUSTMENT:

1. To adjust for minimum distortion, connect the scope probe to the triangle/sine output. Close S2 and adjust the amplitude control to give non-clipping maximum swing. Then adjust R10 and R11 alternately for minimum distortion by observing the sinusoidal waveform. If a distortion meter is available you may use it as a final check on the setting of sine-shaping trimmers. The minimum distortion obtained in this manner is less than 1% from 1Hz to 10 kHz and less than 3% over the entire frequency range.

For further details on the operation of the IC that is the heart of the 20685 refer to the data sheet for the XR2006 monolithic function generator available from Jameco Electronics.

20685 (JE2206) FUNCTION GENERATOR KIT

Important Disclaimer: To the fullest extent permitted by applicable law, Jameco expressly disclaims the implied warranty of fitness for a particular purpose. Customer should understand that Jameco does not make any representation that products purchased will suit customer's particular purpose. Customer must rely on customer's own skill or judgement in selecting suitable products for customer. To the extent any implied warranty is applicable, such warranty shall be limited to 90 days from the date of purchase.

Limitation of Liability: Jameco's liability shall be limited to the repair or replacement of defective products in accordance with the Jameco limited warranty. Jameco shall not be liable for any incidental, special or consequential damages for breach of any warranty, expressed or implied, directly or indirectly arising out of Jameco's sale of merchandise, including any failure to deliver any merchandise, or arising out of customer's installation or use, whether proper or improper, of the product, separately or in combination with other equipment, or from any other cause.

Warranty: Jameco warrants the equipment to be free from defects for a period of 90 days from date of purchase. If found to be defective, these products will be replaced with a new unit, not repaired. No units will be accepted past the 90 day warranty for repair or replacement. There is no charge for any replacement. Equipment or parts which have been subject to abuse, misuse, accident, alteration, neglect and/or unauthorized repair are not covered by the warranty. Seller shall have the right to final determination as to existence and cause of defect.

JAMECO™ ELECTRONIC COMPONENTS COMPUTER PRODUCTS
1355 Shoreway Road
Belmont, CA 94002
TEL 1•415•592•8097
FAX 1•415•592•2503

The following services are available through 415•592•8097 from 7AM - 5PM P.S.T.:
• Sales • Customer Service • Credit Department • All other inquires